

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Title: "System and Method for Improving Backup Performance of Media and Dynamic Ready to Transfer Control Mechanism"

Appellants: Prasenjit Sarkar, et al.

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Board of Patent Appeals and Interferences

Commissioner for Patents

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SUPPLEMENTAL APPEAL BRIEF
REQUEST FOR REINSTATEMENT

Dear Sir:

This Supplemental Appeal Brief is submitted in response to the office action of April 7, 2006. Appellants request the reinstatement of the Appeal.

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(1) Real Party in Interest

The real party in interest is International Business Machines Corporation.

(2) Related Appeals and Interferences

No other appeals or interferences exist that relate to the present application or appeal, other than the originally filed appeal.

(3) Status of Claims

Claims 1-19 and 27-33 are pending and remain in the application. In the Final Office Action of April 4, 2006:

- Claims 27-33 stand rejected under 35 U.S.C. 101 for being directed to non-statutory subject matter.
- Claims 1-19 and 27-33 stand rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,865,617 to Zeidner et al. (hereinafter referred to as Zeidner) in view of USAPN 2003/0056000 to Mullendore et al. (hereinafter referred to as Mullendore), and further in view of "TCP-IMPL Mailing List Archive: Re: OT 1.1.2 trace - delayed Ack" by Eric Schenk (hereinafter referred to as Schenk).

(4) Status of Amendments

No amendment is pending.

(5) Summary of Claimed Subject Matter

The present invention relates in general to a system and a related method for improving the performance when backing up media and data over networks using storage and network transport protocols.

5.1. Problem addressed by the present invention

Prior to presenting substantive arguments in favor of the allowability of the claims on file, it might be desirable to summarize the present invention in view of the problem it addresses. In general, when a PC communicates with the server, it exchanges messages to ensure the integrity of the communication. It is when several PCs attempt to store data at the server simultaneously, that bottlenecks arise, and the throughput and performance slow down to a halt. A need therefore arises for combining these messages, and for reducing the number of transmission, thereby alleviating some of the network load.

5.2. Summary of the subject matter of independent claim 1

Claim 1 describes a method of improving backup performance of block storage over a network with asymmetric traffic (Paragraphs [0001] and [0006]). A client concurrently sends a write command and associated data to a server. (Paragraph [0035]).

The server executing the write command, and delaying transmission of a SCSI Ready to Transfer (RTT) message, if any is scheduled to be issued by the server, to within a predetermined timeout constraint, in order to reduce the number of RTT messages from the server to the client;

The server receives the write command (block 510, FIG. 5), and then checks its buffer space to ensure that it has enough space to receive the data, in which case it replies with an RTT message to the client. Upon

receiving the RTT message, the client starts the transmission of data in the form of a Write Data operation. (Paragraph [0035]).

FIGS. 5 and 6 describe the processing performed at the target and initiator, respectively, in order to combine TCP and SCSI ACKs. TCP ACKs are sent by the target to indicate that the data is successfully received. SCSI ACKs are sent to the client to indicate the completion of the write operation. Thus, TCP ACKs can be delayed at the target and piggybacked along with the SCSI ACKs. (block 530, FIG. 5) Since the TCP/IP ACK is also used for flow control purposes, the SCSI ACK is now also being used for flow control. (Paragraph [0037]).

FIGS. 5 and 6 describe the processing performed at the target and the initiator, respectively, in order to coalesce SCSI ACKs and combine them with TCP ACKs. The SCSI responses can be coalesced at the target to minimize the number of explicit responses that are sent to the initiator. (Paragraph [0045]).

When the SCSI response for a particular write operation is sent to the initiator (blocks 545, 555, FIG. 5), SCSI responses for all of the subsequent completed writes whose SCSI responses are queued at the target are also sent (piggybacked). The coalescing of SCSI responses helps to reduce the number of explicit TCP messages (carrying SCSI responses) that the target needs to send to the source (block 560, FIG. 5). This reduces the CPU utilization at both the source and the target devices, and this, in turn, improves the overall system throughput. (Paragraph [0048]).

5.3. Summary of the subject matter of independent claim 27

While claim 1 exemplifies the present invention in connection with a method for improving backup performance of block storage over a network with asymmetric traffic, claim 27 corresponds to claim 1, and exemplifies the present invention in connection with a computer program product for improving backup performance of block storage over a network with asymmetric traffic.

(6) Grounds of Rejection to be Reviewed on Appeal

Appellants respectfully traverse the following rejections and request that they be reviewed on appeal:

6.1. First Ground of Rejection

- Whether claims 27-33 were properly rejected under 35 U.S.C. 101.

6.2. Second Ground of Rejection

- Whether claims 1-19 and 27-33 are obvious in view of Zeidner, Mullendore, and Schenk.

(7) Arguments

7.A. Argument Responding to the First Ground of Rejection

7.A.1. The Rejection

Claims 27-33 stand rejected under 35 U.S.C. 101 on the ground that the claimed invention is directed to a non-statutory subject matter. The Examiner reasons that: "Applicant has claimed a computer-readable

medium with no support in the specification for such terminology. In current practice, the PTO has seen use of transmission media for example carrier waves, as being defined as a computer-readable medium."

Appellants respectfully traverse this rejection ground, and submit that a person of ordinary skill in the field will clearly recognize the ample support provided in the specification for the element "computer-readable medium." Throughout the specification, particularly in paragraph [0032], which is reproduced below, reference is made to a storage device 310 (reference is also made to FIG. 3), as follows:

"[0032] Storage device 310, which stores data used by the present invention, may comprise, for example, a random-access memory, a magnetic disk and/or optical disk, and may also comprise a magnetic tape. Storage device 310 includes documents storage 312, which includes one or more documents 314A - 314K. Each document is typically stored as one or more files. Each document typically contains at least some text, but may also contain other types of information, such as numeric data, graphics, images, audio, or video."

It should have been amply clear to a person of ordinary skill that storage device 310 could be a disk, a memory, or any other suitable "computer-readable" or "computer-usable" medium.

As a result, claim 27 and the claims dependent thereon satisfy the requirement of 35 USC 101, necessitating the reversal of the Examiner's rejection.

7.B. Argument Responding to the Second Ground of Rejection

7.B.1. The Rejection

Claims 1-19 and 27-33 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Zeidner in view of Mullendore, and Schenk.

Appellants respectfully submit that none one of the cited references discloses all the elements and limitations of the invention as a whole, as recited in the claims on file. Consequently, the claims on file are not obvious in view of the cited references whether considered separately or in combination with each other. In support of this position, Appellants submit the following arguments:

7.B.2. Legal Standard of Obviousness

The following legal authorities set the general legal standards in support of Appellant's position of non obviousness, with emphasis added for added clarity:

- MPEP 706.02(j), "**To establish a prima facie case of obviousness, three basic criteria must be met.** First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on Appellant's disclosure. In re Vaack, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991) ... The initial burden is on the examiner to provide some **suggestion of the desirability** of doing what the inventor has done. "To support the conclusion that the claimed invention is directed to obvious subject matter, either the **references must expressly or impliedly suggest the claimed invention** or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." Ex parte Clapp, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985)."

- **In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is** not whether the differences themselves would have been obvious, but **whether the claimed invention as a whole would have been obvious.** The prior art perceived a need for mechanisms to dampen resonance, whereas the inventor eliminated the need for dampening via the one-piece gapless support structure. "Because that insight was contrary to the understandings and expectations of the art, the structure effectuating it would not have been obvious to those skilled in the art." 713 F.2d at 785, 218 USPQ at 700 (citations omitted).
- MPEP §2143.03, "All Claim Limitations Must Be Taught or Suggested: To establish prima facie obviousness of a claimed invention, **all the claim limitations must be taught or suggested by the prior art.** In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). **"All words in a claim must be considered** in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)."
- MPEP §2143.01, "The Prior Art Must Suggest The Desirability Of The Claimed Invention: There are three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art." In re Rouffet, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) (**The combination of the references taught every element of the claimed invention, however without a motivation to combine, a rejection based on a prima facie case of obvious was held improper.**). The level of skill in the art cannot be relied upon to provide the suggestion to combine references. Al-Site Corp. v. VSI Int'l Inc., 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999).
- **"Obviousness cannot be established** by combining the teachings of the prior art to produce the claimed invention, **absent some teaching or suggestion** supporting the combination." In re Fine, 837 F.2d at 1075, 5 USPQ2d at 1598 (citing ACS Hosp. Sys. v. Montefiore Hosp., 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984)). **What a reference teaches** and whether it teaches toward or **away from the claimed invention** are questions of fact. See Raytheon Co. v. Roper Corp., 724

F.2d 951, 960-61, 220 USPQ 592, 599-600 (Fed. Cir. 1983), cert. denied, 469 U.S. 835, 83 L. Ed. 2d 69, 105 S. Ct. 127 (1984). "

- "When a rejection depends on a combination of prior art references, there must be **some teaching, suggestion, or motivation** to combine the references. See *In re Geiger*, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987). " **Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation** to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See MPEP 2143.01; *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000); *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).
- "With respect to core factual findings in a determination of patentability, however, the **Board cannot simply reach conclusions based on its own understanding or experience** -- or on its assessment of what would be basic knowledge or common sense. **Rather, the Board must point to some concrete evidence in the record** in support of these findings." See *In re Zurko*, 258 F.3d 1379 (Fed. Cir. 2001).
- "We have noted that **evidence of a suggestion, teaching, or motivation to combine** may flow from the prior art references themselves, the knowledge of one of ordinary skill in the art, or, in some cases, from the nature of the problem to be solved, see *Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 1573, 37 USPQ2d 1626, 1630 (Fed. Cir. 1996), *Para-Ordinance Mfg. v. SGS Imports Intern., Inc.*, 73 F.3d 1085, 1088, 37 USPQ2d 1237, 1240 (Fed. Cir. 1995), although "the suggestion more often comes from the teachings of the pertinent references," *Rouffet*, 149 F.3d at 1355, 47 USPQ2d at 1456. The range of sources available, however, does not diminish the requirement for actual evidence. That is, **the showing must be clear and particular**. See, e.g., *C.R. Bard*, 157 F.3d at 1352, 48 USPQ2d at 1232. **Broad conclusory statements regarding the teaching of multiple references, standing alone, are not "evidence."** E.g., *McElmurry v. Arkansas Power & Light Co.*, 995 F.2d 1576, 1578, 27 USPQ2d 1129, 1131 (Fed. Cir. 1993) ("Mere denials and conclusory statements, however, are not sufficient to establish a genuine issue of material fact."); *In re Sichert*, 566 F.2d 1154, 1164, 196 USPQ 209, 217 (CCPA 1977). See *In re Dembiczak*, 175 F.3d 994 (Fed. Cir. 1999).

- "To prevent the use of hindsight based on the invention to defeat patentability of the invention, **this court requires the examiner to show a motivation to combine the references** that create the case of obviousness. In other words, **the examiner must show reasons** that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references **for combination in the manner claimed**." See *In re Rouffet*, 149, F.3d 1350 (Fed. Cir. 1998).
- The mere fact that references can be combined or modified does not render the resultant combination obvious **unless the prior art also suggests the desirability of the combination**. In *re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Although a prior art device "may be capable of being modified to run the way the apparatus is claimed, **there must be a suggestion or motivation in the reference** to do so." 916 F.2d at 682, 16 USPQ2d at 1432.). See also *In re Fritch*, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992) (flexible landscape edging device which is conformable to a ground surface of varying slope not suggested by combination of prior art references).
- If the **proposed modification would render the prior art invention being modified unsatisfactory** for its intended purpose, **then there is no suggestion or motivation** to make the proposed modification. In *re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

7. B.3. Application of the Obviousness Standard to the Present Invention

The Examiner bases the rejection of claim 1, on the following ground:

"Regarding claim 1, Zeidner teaches a method of improving backup performance of block storage over a network with asymmetric traffic, comprising:

a client concurrently sending a write command and associated data to a server (col. 2, lines 16-48; figure 4: 401; col. 8, lines 41-43));

the server executing the write command (col. 9, lines 24-30; col. 10, lines 8-50);

the server combining a protocol acknowledgment message with a SCSI acknowledgment message, into an acknowledgment message, and transmitting the combined acknowledgment

message to the client (abstract; col. 1, lines 46-57; col. 3, lines 3-21); and

upon receipt of the combined acknowledgment message, the client recognizing a successful execution of the write command by the server (col. 10, lines 8-50).

However, Zeidner does not explicitly teach the server delaying transmission of a SCSI RTT message to within a predetermined timeout constraint, in order to reduce the number of RTT messages from the server to the client, and the client de-allocating a buffer that contains the associated data upon receipt of the combined acknowledgement message.

Mullendore teaches delaying a SCSI RTT message within a predetermined timeout constraint [0044-0056; 0058; 0120] and de-allocating a buffer that contains the associated data upon receipt of acknowledgement message [0060].

However, Mullendore does not explicitly teach intentionally delaying the SCSCC RTT message as claimed. In an analogous art, Schenk teaches the delay of RTT message in order to avoid unnecessary retransmission of message by the sender (page 2).

At the time the invention was made, one of ordinary skill in the art would have been motivated to delay a SCSI RTT message in order to reduce traffic, thus reducing latency, and de-allocating a buffer in order to ensure that data is received, thus maximizing the backup performance efficiency."

Zeidner generally describes a mechanism to leverage the TCP/IP multicasting facility to implement backup across multiple targets. In essence, Zeidner addresses a different problem than the present invention, as it focuses on leveraging the IP multi-cast network.

Furthermore, Appellants agree with the Examiner that: (1) **Zeidner does not explicitly teach the server delaying transmission of a SCSI RTT message** to within a predetermined timeout constraint; and (2) **Mullendore does not explicitly teach intentionally delaying the SCSCC RTT message** as claimed. The Examiner resorts to Schenk as describing the element missing from Zeidner and Mullendore.

It is quite important to note that **the introduction of an intentional delay in the transmission of a SCSI Ready to Transfer (RTT) message, is part of the present invention**, as recited in the claims. As a result, since the main reference, namely Zeidner, does not teach the introduction of the intentional delay, as admitted by the Examiner, Zeidner does not capture the invention as a whole, as required by the legal authorities cited earlier.

In addition, Appellants agree with the Examiner, and respectfully submit that Mullendore does not teach the introduction of intentional delay as recited in claim 1. Rather, **Mullendore teaches away from this concept, and teaches expediting the transmission of the frames to reduce the latency**. Reference is made to Mullendore, Paragraph [0057], which is reproduced below with emphasis added:

"[0057] The problems set forth above may at least in part be solved by a system and method for reordering received frames **to ensure that transfer ready (XFER_RDY) frames among the received frames are handled at higher priority, and thus with lower latency**, than other received frames."

As a result, even if Mullendore were combined with Zeidner, as suggested by the Examiner, such a **hypothetical combination will still teach away from the present invention**.

In addition, Schenk does not describe the introduction of an intentional delay if any is scheduled to be issued by the server, to within a predetermined timeout constraint, in order to reduce the number of RTT messages from the server to the client (as recited in claim 1). Rather, Schenk's delay is not intentional and certainly not to reduce the number of

RTT messages from the server to the client. Reference is made to the following two excerpts from page 2 of Schenk that explain the nature of the delay in Schenk, and which should not be confused with the intentional delay that is introduced by the present invention:

"First, delaying ACK's distorts the RTT calculation on the sender side. If the delay is less than the granularity with which the sender measures RTT, then the distortion is minimal, although we can still get some distortion when a delay causes the RTT measure to increase by 1."

"Second, any time we actually fire the delayed ack timer, due to a pause in the stream of packets in the sender, the sooner we fire it, the better. This is because if we wait too long to fire it, the sender might conclude that a packet has been lost, and it should now resend, when in fact no packet has been lost."

In addition, neither Zeidner, Mullendore, nor Schenk teaches "the server combining a protocol acknowledgment message with the delayed SCSI RTT message, into an acknowledgment message, and transmitting the combined acknowledgment message to the client".

The Examiner states that in Zeidner: "the server combining a protocol acknowledgment message with a SCSI acknowledgment message, into an acknowledgment message, and transmitting the combined acknowledgment message to the client (abstract; col. 1, lines 46-57; col. 3, lines 3-21)".

However, Appellants respectfully submit that a key feature in the instant claim 1 is to combine the protocol acknowledgment message with the delayed SCSI RTT message. Since the Examiner admits the lack of teaching of the introduction of intentional delay, it follows that Zeidner does


combine a "delayed" SCSI RTT message with the protocol acknowledgment message. The Examiner did not acknowledge the presence of this feature in Mullendore. Appellants submit that this feature is not described in Mullendore.

Claim 1 is thus not obvious in view of Zeidner or Mullendore, and the allowance of this claim and the claims dependent thereon is earnestly solicited.

Independent claim 27 is allowable for containing a similar subject matter to that of claim 1. Therefore, claim 27 and the claims dependent thereon are also allowable.

Respectfully submitted,

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APPENDIX A
CLAIMS ON APPEAL

1. A method of improving backup performance of block storage over a network with asymmetric traffic, comprising:

a client concurrently sending a write command and associated data to a server;

the server executing the write command, and delaying transmission of a SCSI Ready to Transfer (RTT) message, if any is scheduled to be issued by the server, to within a predetermined timeout constraint, in order to reduce the number of RTT messages from the server to the client;

the server combining a protocol acknowledgment message with the delayed SCSI RTT message, into an acknowledgment message, and transmitting the combined acknowledgment message to the client; and

upon receipt of the combined acknowledgment message, the client recognizing a successful execution of the write command by the server and de-allocating a buffer that contains the associated data.

2. The method of claim 1, wherein the server further selectively delays an issuance of the protocol acknowledgment message from the server to the client.

3. The method of claim 2, wherein the protocol acknowledgment message is a TCP/IP acknowledgment message.

4. The method of claim 3, wherein the combined acknowledgment message is a combined SCSI /TCP/IP acknowledgment message.

5. The method of claim 2, wherein the client sends a sequence of asynchronous write commands to the server.

6. The method of claim 5, wherein the server delays the issuance of a combined SCSI /TCP/IP acknowledgment message for each of the write commands.

7. The method of claim 6, wherein the server further merges combined SCSI /TCP/IP acknowledgment messages for at least some of the write commands into a batch SCSI /TCP/IP acknowledgment message.

8. The method of claim 7, wherein the server sends the batch SCSI /TCP/IP acknowledgment message to the client.

9. The method of claim 8, wherein in response to the batch SCSI /TCP/IP acknowledgment message, the client de-allocates buffers associated with the at least some of the write commands.

10. The method of claim 2, wherein the server transmits the combined acknowledgment message to the client before an expiration of a predefined acknowledgment constraint window.

11. The method of claim 10, wherein the predefined acknowledgment constraint window is approximately 500 msec.

12. The method of claim 2, further including the step of instructing the client to delay resending the write command and associated data to the server.

13. The method of claim 12, wherein the instructing step comprises adding a predetermined delay interval to a round trip time.

14. The method of claim 13, wherein adding the predetermined delay interval comprises adding approximately 500 msec to the round trip time.

15. The method of claim 1, wherein, upon detecting congestion, the server does not delay the issuance of the protocol acknowledgment message to the client.

16. The method of claim 15, wherein the server detects congestion by receiving a notification from the client.

17. The method of claim 16, wherein the notification from the client comprises a message indicating a rate at which client buffers are getting full.

18. The method of claim 1, wherein the network comprises a wide area network.

19. The method of claim 1, wherein the network comprises a local area network.

20 - 26. (Canceled)

27. A computer program product having a plurality of executable instruction codes stored on a computer-readable medium, for improving backup performance of block storage over a network with asymmetric traffic, the computer program product comprising:

- a first set of instruction codes concurrently sending a write command and associated data to a server;

- a second set of instruction codes residing on the server, for executing the write command, and delaying transmission of a SCSI Ready to Transfer (RTT) message, if any is scheduled to be issued by the server, to within a predetermined timeout constraint, in order to reduce the number of RTT messages from the server to the client;

- a third set of instruction codes residing on the server, for combining a protocol acknowledgment message with the delayed SCSI RTT message, into an acknowledgment message, and transmitting the combined acknowledgment message to a client; and

- upon receipt of the combined acknowledgment message, a fourth set of instruction codes residing on the client, for recognizing a successful execution of the write command by the server and de-allocating a buffer that contains the associated data.

28. The computer program product of claim 27, wherein upon recognizing a successful execution of the write command by the server, the client de-allocates a buffer that contains the data.

29. The computer program product of claim 28, wherein the server monitors a buffer consumption; and

if the buffer consumption exceeds a predetermined level, a fifth set of instruction codes residing on the server sending a message to the client, instructing the client to delay sending the data to the server.

30. The computer program product of claim 29, further comprising a sixth set of instruction codes for instructing the client to await a RTT message prior to sending the data to the server.

31. The computer program product of claim 29, wherein the predetermined level is approximately 90% of a total server buffer capacity.

32. The computer program product of claim 30, wherein if the buffer consumption is below the predetermined level, an eight set of instruction codes residing on the server sending a message to the client, instructing the client to not delay sending the data to the server.

33. The computer program product of claim 28, wherein a ninth set of instruction codes residing on the server selectively delaying an issuance of the protocol acknowledgment message from the server to the client.

APPENDIX B
EVIDENCE

None